



## Incident Response Pocket Guide



PMS #461  
NFES #1077  
January 2002

## Size Up Report

- **Incident Name**
- **Incident Commander**
- **Incident Type**  
Wildland fire, vehicle accident, HazMat, search and rescue, etc.
- **Incident Status**
- **Location**
- **Jurisdiction**
- **Radio Frequencies**
- **Incident Size**
- **Fuel Type**
- **Wind Speed and Direction**
- **Slope and Aspect**
- **Best Access**
- **Special Hazards or Concerns**
- **Additional Resource Needs**



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Prepared by  
Incident Operations Standards Working Team

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## Operational Leadership Guide

The most essential element of successful wildland firefighting is competent and confident leadership. Leadership means providing purpose, direction and motivation for wildland firefighters working to accomplish difficult tasks under dangerous, stressful circumstances. In confusing and uncertain situations, a good operational leader will:

- TAKE CHARGE of assigned resources.
- MOTIVATE firefighters with a “can do safely” attitude.
- DEMONSTRATE INITIATIVE by taking action in the absence of orders.
- COMMUNICATE by giving specific instructions and asking for feedback.
- SUPERVISE at the scene of action.

### A GOOD LEADER MUST:

#### **Be technically and tactically proficient**

- Take charge when in charge.
- Adhere to professional standard operating procedures.
- Develop a plan to accomplish given objectives.

#### **Be responsible for your actions**

- Accept responsibility for team performance.
- Credit subordinates for good performance.
- Take full responsibility for and correct poor performance.

#### **Know yourself and seek self-improvement**

- Know the strengths/weaknesses in your character and skill level.
- Ask questions of peers and superiors.
- Actively listen to feedback from subordinates.

#### **Know your firefighters and look out for their well-being**

- Put the safety of your subordinates above all other objectives.
- Take care of your subordinates physical, mental, and spiritual needs.
- Resolve conflicts between individuals on the team.

#### **Set the example**

- Share the hazards and hardships with your subordinates.
- Don’t show discouragement when facing setbacks.
- Choose the difficult right over the easy wrong.

## **Operational Leadership Guide (cont.)**

### **Make sound and timely decisions**

- Maintain situation awareness in order to anticipate needed actions.
- Develop contingencies and consider consequences.
- Improvise within the commander's intent to handle a rapidly changing environment.

### **Keep your firefighters informed**

- Provide accurate and timely Briefings.
- Give the reason (intent) for assignments and tasks.
- Make yourself available to answer questions at appropriate times.

### **Ensure the task is understood, supervised and accomplished**

- Issue clear instructions.
- Observe and assess actions in progress without micro-managing.
- Use positive feedback to modify duties, tasks, and assignments when appropriate.

### **Develop a sense of responsibility in your firefighters**

- Clearly state expectations.
- Delegate those tasks that you are not required to do personally.
- Provide early warning to subordinates of tasks they will be responsible for.

### **Build the team**

- Conduct frequent Debriefings with the team to identify lessons learned.
- Recognize individual and team accomplishments and reward them appropriately.
- Apply disciplinary measures equally.

### **Employ your team in accordance with its capabilities**

- Observe human behavior as well as fire behavior.
- Consider team experience, conditioning, fatigue, and injury limitations when accepting assignments.
- Consider individual skill levels and developmental needs when assigning tasks.

## **Risk Management Process**

### **Step 1 Situation Awareness**

Gather Information

- |  |   |
|--|---|
| <input type="checkbox"/> Objective(s)    | <input type="checkbox"/> Previous Fire Behavior |
| <input type="checkbox"/> Communication   | <input type="checkbox"/> Weather Forecast       |
| <input type="checkbox"/> Who's in Charge | <input type="checkbox"/> Local Factors          |

Scout the Fire

### **Step 2 Hazard Assessment**

Estimate Potential Fire Behavior Hazards

- ☐ Look Up/Down/Around Indicators

Identify Tactical Hazards

- ☐ Watch Outs

What other safety hazards exist?

Consider severity vs. probability?

### **Step 3 Hazard Control**

Fire Orders -> LCES Checklist - MANDATORY

- ☐ Anchor Point  
☐ Downhill Checklist (if applicable)

What other controls are necessary?

### **Step 4 Decision Point**

Are controls in place for identified hazards?

NO - Reassess situation      YES - Next question

Are selected tactics based on expected fire behavior?

NO - Reassess situation      YES - Next question

Have instructions been given and understood?

NO - Reassess situation      YES - Initiate action

### **Step 5 Evaluate**

Personnel: Low experience level with local factors?

Distracted from primary tasks?

Fatigue or stress reaction?

Hazardous attitude?

The Situation: What is changing?

Are strategy and tactics working?



**Look Up, Down and Around**  
(Pay special attention to indicators in bold print.)

Fire Environment Factors	Indicators
<b>Fuel Characteristics</b> Assess	<b>Continuous fine fuels</b> Heavy loading of dead and down Ladder fuels Tight crown spacing (<20 ft.) Special Conditions: Firebrand sources Numerous snags Preheated canopy Frost and bug kill Unusual fine fuels High dead to live ratio
<b>Fuel Moisture</b> Feel and Measure	<b>Low RH (&lt;25%)</b> Low 10 hr FMC (<6%) Drought conditions Seasonal drying
<b>Fuel Temperature</b> Feel and Measure	<b>High temps (&gt;85F)</b> High % of fuels w/direct sun Aspect fuel temp. increasing
<b>Terrain</b> Scout	<b>Steep slopes (&gt;50%)</b> <b>Chutes - Chimneys</b> Box canyons Saddles Narrow canyons

**Look Up, Down and Around**  
(Pay special attention to indicators in bold print.)

Fire Environment Factors	Indicators
<b>Wind</b> Observe	<b>Surface winds above 10 mph</b> Lenticular clouds High, fast-moving clouds Approaching cold fronts Cumulonimbus development Sudden calm <b>Battling or shifting winds</b>
<b>Stability</b> Observe	Good visibility Gusty winds and dust devils Cumulus clouds Castellatus clouds in the a.m. Smoke rises straight up Inversion beginning to lift Thermal belt
<b>Fire Behavior</b> Watch	Leaning column Sheared column <b>Well-developed column</b> Changing column <b>Trees torching</b> Smoldering fires picking up Small firewhirls beginning <b>Frequent spot fires</b>

### **Common Denominators of Fire Behavior on Tragedy Fires**

There are four major common denominators of fire behavior on fatal and near-fatal fires. Such fires often occur:

1. On relatively small fires or deceptively quiet areas of large fires.
2. In relatively light fuels, such as grass, herbs, and light brush.
3. When there is an unexpected shift in wind direction or in wind speed.
4. When fire responds to topographic conditions and runs uphill.

Alignment of topography and wind during the burning period should always be considered a trigger point to re-evaluate strategy and tactics.

## **Tactical Watch Outs**

### **Position**

1. Building fireline downhill.
2. Building underslung or mid-slope fireline.
3. Building indirect fireline, or unburned fuel remains between you and the fire.
4. Attempting frontal assault on the fire, or you are delivered by aircraft to the top of the fire.
5. Terrain and/or fuels make escape to safety zones difficult.

### **Situation**

6. Small fire transitioning to a larger fire or an isolated area of a large fire.
7. Suppression resources are fatigued or inadequate.
8. Assignment depends on aircraft support.
9. Night-time operations.
10. Wildland-Urban interface operations.

**Each of these Watch Outs require that you implement appropriate hazard control(s).**


## LCES Checklist

**LCES** must be established and known to  
**ALL** firefighters **BEFORE** needed.

\_\_\_\_\_ Lookout(s) \_\_\_\_\_  
Experienced / Competent / Trusted  
Enough lookouts at good vantage points  
Knowledge of crew locations  
Knowledge of escape and safety locations  
Knowledge of disengagement trigger points  
Map / Weather Kit / Watch / IAP

\_\_\_\_\_ Communication(s) \_\_\_\_\_  
Radio frequencies confirmed  
Backup procedures and check-in times established  
Provide updates on any situation change  
Sound alarm early, not late

\_\_\_\_\_ Escape Route(s) \_\_\_\_\_  
More than one escape route  
Avoid uphill escape routes  
Scouted: Loose soils / Rocks / Vegetation  
Timed: Slowest person / Fatigue and Temperature factors  
Marked: Flagged for day or night (NFES 0566)  
Evaluate: Escape time vs. Rate of spread  
Vehicles parked for escape

\_\_\_\_\_ Safety Zone(s) \_\_\_\_\_  
Survivable without a fire shelter  
Back into clean burn  
Natural Features: Rock Areas / Water / Meadows  
Constructed Sites: Clearcuts / Roads / Helispots  
Scouted for size and hazards  
Upslope?  More heat impact — Larger safety zone  
Downwind?  
Heavy Fuels?

Escape time and safety zone size requirements  
will change as fire behavior changes.

## Safety Zone Guidelines

- Avoid locations that are downwind from the fire.
- Avoid locations that are in chimneys, saddles, or narrow canyons.
- Avoid locations that require a steep uphill escape route (greater than 50%).
- Take advantage of heat barriers such as lee side of ridges, large rocks, or solid structures.
- Burn out safety zones prior to flame front approach.
- For radiant heat only, the distance separation between the firefighter and the flames must be at least 4 times the maximum flame height. This distance must be maintained on all sides, if the fire has ability to burn completely around the safety zone. **Convective heat from wind and/or terrain influences will increase this distance requirement. The calculations in the table below assume no slope and no wind.**

Flame Height	Distance Separation (firefighters to flame)	Area in Acres
10 ft.	40 ft.	1/10 acre
20 ft.	80 ft.	1/2 acre
50 ft.	200 ft.	3 acres
75 ft.	300 ft.	7 acres
100 ft.	400 ft.	12 acres
200 ft.	800 ft.	50 acres

*Distance Separation is the radius from the center of the safety zone to the nearest fuels. When fuels are present that will allow the fire to burn on all sides of the safety zone this distance must be doubled in order maintain effective separation in front, to the sides, and behind the firefighters.*

*Area in Acres is calculated to allow for distance separation on all sides for a three person engine crew. One acre is approximately the size of a football field or exactly 208 feet x 208 feet.*

### **Downhill Checklist**

Downhill fireline construction is hazardous in steep terrain, fast-burning fuels, or rapidly changing weather. Downhill fireline construction should not be attempted unless there is no tactical alternative. When building downhill fireline, the following is required:

- 1.** Crew supervisor(s) and fireline overhead will discuss assignments prior to committing crew(s). Responsible overhead individual will stay with job until completed (TFLD or ICT4 qualified or better).
- 2.** Decision will be made after proposed fireline has been scouted by supervisor(s) of involved crew(s).
- 3.** L.C.E.S. will be coordinated for all personnel involved.
  - Crew supervisor(s) is in direct contact with lookout who can see the fire.
  - Communication is established between all crews.
  - Rapid access to safety zone(s) in case fire crosses below crew(s).
- 4.** Direct attack will be used whenever possible; if not possible, the fireline should be completed between anchor points before being fired out.
- 5.** Fireline will not lie in or adjacent to a chute or chimney.
- 6.** Starting point will be anchored for crew(s) building fireline down from the top.
- 7.** Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge.

## **Strategy - Direct Attack**

### **Advantages**

- Minimal area is burned; no additional area is intentionally burned.
- It's the safest place to work; firefighters can usually escape into the burned area.
- The possibility of fire moving into the brush or crowns of trees is reduced.
- The uncertainties of burning out or backfiring can be reduced/eliminated.

### **Disadvantages**

- Firefighters can be hampered by heat, smoke and flames.
- Control lines can be very long and irregular because the line follows the edge of the fire.
- Burning material can easily spread across mid-slope lines.
- May not be able to use natural or existing barriers.
- More mop-up and patrol is usually required.



## **Strategy - Indirect Attack**

### **Advantages**

- The line can be located along favorable topography.
- Natural or existing barriers can be used.
- Firefighters may not have to work in smoke and heat.
- The line can be constructed in lighter fuels.
- There may be less danger of slopovers.

### **Disadvantages**

- More land will be burned.
- Must be able to trade time and space to allow line to be constructed.
- Firefighters may be placed in more danger because they are distant from the fire and can't observe it.
- There may be some dangers related to burning out or backfiring.
- The fire may cross the line before it's fired.
- Burning out may leave unburned islands of fuel.
- May not be able to use line already built.

### **Wildland-Urban Watch Outs**

- Poor access and narrow one-way roads.
- Bridge load limits.
- Wooden construction and wood shake roofs.
- Inadequate water supply.
- Natural fuels 30' or closer to structures.
- Structures in chimneys, box canyons, narrow canyons, or on steep slopes (30% or greater).
- Extreme fire behavior.
- Strong winds.
- Evacuation of public (panic).

### **Powerline Safety**

- Downed conductor on vehicle: stay in vehicle until power company arrives. If the vehicle is on fire or fire is near, jump clear, but don't hang on. Keep feet together and bunny hop away.
- Smoke, water, and retardant are all good conductors and can cause powerline to ground arcing.
- Don't operate heavy equipment under powerlines.
- Don't use rights-of-way as a jump or cargo drop spot.
- Don't drive with long antennas under powerlines.
- Don't fuel vehicles under powerlines.
- Don't stand near powerlines during retardant drops.
- Don't park under powerlines.
- Don't apply straight stream to powerlines.

### Structure Protection Checklist

- Check roads before the fire hits. Know turnouts and bridge limits.
- Check each home for defense. Use Structure Assessment Checklist.
- Stay mobile; keep engine running, red lights on.
- Back in equipment for quick escape.
- Brief firefighters on plan and verify radio contact with lookout.
- Coil a short 1-1/2" charged line with fog nozzle on your engine for safety and quick knock-down.
- Use short hose-lays.
- Keep at least 100 gallons of water in your tank.
- Determine if residents are home. Advise residents of escape routes, safety zones and evacuation center. Ask residents to evacuate threatened livestock or pets. Leave home lights on inside and out, day and night.
- Place owner's ladder at a corner of home on side least threatened by fire.
- Coil and charge garden hoses.
- Identify hazards at site; i.e., LPG, pesticides, paint storage, electrical wires.
- Don't enter a burning structure unless you are trained, equipped and authorized.
- If a home becomes well-involved, LEAVE IT; move on to one you can save.
- ALWAYS WEAR ALL YOUR SAFETY GEAR.
- **Firefighter safety and survival is the number one priority.**

## **Structure Assessment Checklist**

### **Address/Property Name**

- Numerical street address, ranch name, etc.
- Residents on site?

### **Road Access**

- Number of lanes, vegetation clearance?
- Road grade greater than 15%?
- Creek crossings, clearance problems, drivable surface?
- Turn outs, turn arounds?
- Bridges - adequate support structure?

### **Building Construction**

- Roof - asphalt, fiberglass, tile, rock, metal or wood shake, debris, other easily combustible material?
- Eaves - covered and little overhang or exposed with large overhang?
- Other features - exposed wooden structural elements, overhangs slope, attached wood deck, lightweight flammable curtains, large windows face heat source?

### **Structure Assessment Checklist (cont.)**

#### **Defensible Space**

- 100' vegetation max. 18" high and 30-foot complete vegetation clearance?
- Flammable trees adjacent to structure?
- Other combustibles adjacent to structure?
- Structure located on narrow ridge, in a chimney, narrow canyon, or mid-slope; and defensible space less than 200'?

#### **Hazardous Materials**

- Pesticides, herbicides, flammable material or other unknown storage?
- Power lines or transformers near apparatus placement areas?
- LPG tanks near apparatus placement areas?

#### **Available Water**

- Hydrant or standpipe, water storage tank with valve, swimming pool with access?

#### **Estimated Resources for Protection Plan**

- Number and type engines, water tenders, crews, dozers?
- Evacuation needs?

## Extended Attack Transition Analysis

*If you check "YES" on 3 or more items, consider ordering an Incident Management Team.*

	YES	NO
Fuels extremely dry and susceptible to long-range spotting or you are currently experiencing extreme fire behavior.	<input type="checkbox"/>	<input type="checkbox"/>
Weather forecast indicating no significant relief or worsening conditions.	<input type="checkbox"/>	<input type="checkbox"/>
Current or predicted fire behavior dictates indirect control strategy with large amounts of fuel within planned perimeter.	<input type="checkbox"/>	<input type="checkbox"/>
Performance of firefighting resources affected by cumulative fatigue.	<input type="checkbox"/>	<input type="checkbox"/>
Overhead overextended mentally and/or physically.	<input type="checkbox"/>	<input type="checkbox"/>
Communication ineffective with tactical resources or dispatch.	<input type="checkbox"/>	<input type="checkbox"/>
150 or more personnel assigned to incident or more than three divisions.	<input type="checkbox"/>	<input type="checkbox"/>
Incident action plans, briefings, etc. missing or poorly prepared.	<input type="checkbox"/>	<input type="checkbox"/>
Variety of specialized operations, support personnel or equipment.	<input type="checkbox"/>	<input type="checkbox"/>
Unable to properly staff air operations.	<input type="checkbox"/>	<input type="checkbox"/>
Limited local resources available for initial attack.	<input type="checkbox"/>	<input type="checkbox"/>
Heavy commitment of local resources to logistical support.	<input type="checkbox"/>	<input type="checkbox"/>
Existing forces have worked 24 hours without success.	<input type="checkbox"/>	<input type="checkbox"/>
Resources unfamiliar with local conditions and tactics.	<input type="checkbox"/>	<input type="checkbox"/>
Urban interface: structures, developments, recreational facilities, or potential for evacuation.	<input type="checkbox"/>	<input type="checkbox"/>
Fire burning or threatening more than one jurisdiction and potential for unified command with different or conflicting management objectives.	<input type="checkbox"/>	<input type="checkbox"/>
Unique natural resources, special-designation areas, critical municipal watershed, T& E species habitat, cultural value sites.	<input type="checkbox"/>	<input type="checkbox"/>
Sensitive political concerns, media involvement, or controversial fire policy.	<input type="checkbox"/>	<input type="checkbox"/>

## **After Action Review**

### **What was planned?**

- Review the primary objectives and expected action plan.

### **What actually happened?**

- Review the day's actions:
  - ☐ Identify and discuss effective and non-effective performance.
  - ☐ Identify barriers that were encountered and how they were handled.
  - ☐ Discuss all actions that were not standard operating procedure, or those that presented safety problems.

### **Why did it happen?**

- Discuss the reasons for ineffective or unsafe performance. Concentrate on WHAT, not WHO, is right.

### **What can we do next time?**

- Determine lessons learned and how to apply them in the future.

## **How to Properly Refuse Risk**

Every individual has the right and obligation to report safety problems and contribute ideas regarding their safety. Supervisors are expected to give these concerns and ideas serious consideration. When an individual feels an assignment is unsafe they also have the obligation to identify, to the degree possible, safe alternatives for completing that assignment. Turning down an assignment is one possible outcome of managing risk.

A "turn down" is a situation where an individual has determined they cannot undertake an assignment as given and they are unable to negotiate an alternative solution. The turn down of an assignment must be based on an assessment of risks and the ability of the individual or organization to control those risks. Individuals may turn down an assignment as unsafe when:

1. There is a violation of safe work practices.
  2. Environmental conditions make the work unsafe.
  3. They lack the necessary qualifications or experience.
  4. Defective equipment is being used.
- Individual will directly inform their supervisor that they are turning down the assignment as given. The most appropriate means to document the turn down is using the criteria (10 Fire Orders, 18 Watch Out Situations, etc.) outlined in the Risk Management Process.
  - Supervisor will notify the Safety Officer immediately upon being informed of the turn down. If there is no Safety Officer, notification shall go to the appropriate Section Chief or to the Incident Commander. This provides accountability for decisions and initiates communication of safety concerns within the incident organization.
  - If the supervisor asks another resource to perform the assignment, they are responsible to inform the new resource that the assignment has been turned down and the reasons that it was turned down.
  - If an unresolved safety hazard exists or an unsafe act was committed, the individual should also document the turn down by submitting a SAFENET (ground hazard) or SAFECOM (aviation hazard) form in a timely manner.

These actions do not stop an operation from being carried out. This protocol is integral to the effective management of risk as it provides timely identification of hazards to the chain of command, raises risk awareness for both leaders and subordinates, and promotes accountability.



## Last Resort Survival

LOOK AT YOUR OPTIONS AND IMMEDIATELY ACT ON THE BEST ONE!  
UTILIZE ALL P.P.E.!  
PROTECT YOUR AIRWAY!

### Escape if you can:

- Drop any gear not needed for fire shelter deployment (keep your fire shelter, handtool, quart of water, and radio).
- You may be able to use the fire shelter for a heat shield as you move.
- In LIGHT FUELS, you may be able to move back through the flames into the black.
- If you are on the flank of the fire, try to get below the fire.
- Consider vehicles or helicopters for escape.

### Find a survivable area:

- Stay out of hazardous terrain features.
- Use bodies of water that are more than 2 feet deep.
- In LIGHT FUELS, you may be able to light an escape fire.
- In other fuels, you may be able to light a backfire.
- Call for helicopter or retardant drops.
- Cut and scatter fuels if there is time.
- Use any available heat barriers (structures, large rocks, dozer berms).
- Consider vehicle traffic hazards on roads.

### Pick a fire shelter deployment site:

- Find the lowest point available.
- Maximize distance from nearest aerial fuels or heavy fuels.
- Pick a surface that allows the fire shelter to seal and remove ground fuels.
- Get into the fire shelter before the flame front hits.
- Position your feet toward the fire and hold down the fire shelter.
- Keep your face pressed to the ground.
- Deploy next to each other and keep talking.

### Expect:

- Extremely heavy ember showers.
- Superheated air blast to hit before the flame front hits.
- Noise and turbulent powerful winds hitting the fire shelter.
- Pin holes in the fire shelter that allow fire glow inside.
- Heat inside the shelter = Extreme heat outside.
- Deployments have lasted up to 90 minutes.
- When in doubt wait it out.



**NOTES**

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## **Vehicle Accident IC Checklist**

### **Report on Conditions**

- Hazards (fuel, electrical, traffic, access etc.).
- Need for law enforcement, ambulance, helicopter, tow truck, extrication tools.
- Injuries (number of victims, severity).
- Vehicles (number, type).

### **Establish Traffic Control**

- Place apparatus between oncoming traffic and rescuers. Keep exhaust from pointing at scene, victims.
- Place warning devices.
- Establish positive communications.

### **Assess Fire Hazard or Potential**

- Take suppression action as needed if trained, equipped and authorized.
- Be aware of fuels running downgrade.

### **Perform Patient Assessment**

- Provide first aid or triage assessment.
- If there are fatalities, do not give names or other information over radio that would reveal identity, and do not move body.

### **Begin Incident Report. Document All Events.**

### **Advise Agency Dispatcher of Changes**

- Incident status; i.e. arrival of other units, patient transport, available on scene, etc.

## **HazMat IC Checklist**

### **Think Safety**

- Safe approach: upwind/upgrade/upstream.
- Isolate and deny entry.
- Notify agency dispatcher.
- Request needed assistance via safe route.

### **Scene Management**

- Goal is to protect life, environment and property.
- Attempt to identify substance using North American Emergency Response Guide, occupancy/location, placards/labels, container shapes/colors, MSDS, shipping papers. Use binoculars!
- Assess situation.
- Exact location.
- Identity and quantity of material involved.
- Exposures and hazards.

### **Assume role of IC until relieved by responsible agency**

- Assign safety officer.
- Develop action plan for area security and evacuation. Advise dispatcher.
- Advise all units of changes in situation.
- Document all actions taken and contacts.
- Document employee exposure.

### **Rules of thumb for isolation distances:**

- Minor event (1 drum, 1 bag, etc.) = 150'
- Major event (more than 1 drum, etc.) = 500'
- Residential and light commercial = 300'
- Open areas = 1000'
- BLEVE potential = 2500'
- Stage arriving units 2500' upwind.
- Position vehicles headed out.

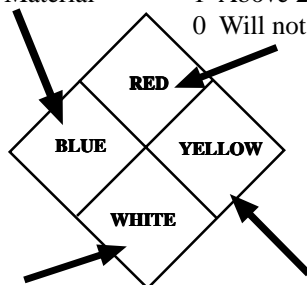
### NFPA 704 HazMat Classification For Fixed Facilities

#### HEALTH HAZARD

- 4 Deadly
- 3 Extreme Danger
- 2 Hazardous
- 1 Slightly Hazardous
- 0 Normal Material

#### FIRE HAZARD

- 4 Below 73°F
- 3 Below 100°F
- 2 Below 100°F not exceeding 200°F
- 1 Above 200°F
- 0 Will not burn



#### SPECIFIC HAZARD

- ACID - Acid
- ALK - Alkali
- COR - Corrosive
- OXY - Oxidizer
- P - Polymerization
- ☢ - Radioactive
- W - Use no water

#### REACTIVITY

- 4 May detonate
- 3 Shock & heat may detonate
- 2 Violent chemical change
- 1 Unstable if heated
- 0 Stable



### **Major Disaster Considerations**

- Assess crews for injuries.
- Move apparatus out of station if possible.
- Assess the station for damage.
- Determine if phones are working.
- Check for power - normal or auxiliary?
- Monitor phone and radio for dispatch information.
- Report by radio to dispatch or IC if established.
- Initiate a “windshield survey” of first response area.
- Do not fully commit to any incident.
  - Prioritize incidents with respect to life, hazard, property.
  - Note any damage to infrastructure (roads, bridges, etc.).
  - Check for hazardous utility situations (gas, electric, water).
  - Note structural instability/collapse of any buildings.
  - Expect malfunctioning automatic alarms.
  - Use “negative reporting.” Only report things out of the ordinary.
- Follow local disaster plans.

## Structural Triage and Search Assessment Marking

Never enter a damaged structure unless trained, equipped and authorized. You may find a 2' x 2' box at the entrance (or an arrow to indicate the entrance) to the compromised structure. Orange spray paint or a lumber crayon should be used to mark hazards and condition inside the box.

- ☐ Structure is safe for Search and Rescue (SAR) (minor damage, or structure is fully collapsed).
- ☒ Structure is significantly damaged with some safe areas, but other areas which need to be shored up or braced. Falling and collapse hazards need to be removed.
- ☒ Structure is unsafe for SAR. May collapse suddenly.

← Entrance is located in direction of the arrow.

HM Hazardous material is present (note type of material). Consult HazMat Team and cooperate.

Time, date, specialist ID and HazMats identified should be written outside the upper right portion of the box. Building may be re-evaluated for additional hazards.

— Single slash (2' long) indicates SAR Team is currently in structure conducting operations.

✕ Cross/slash (2' x 2') indicates SAR Team has left structure, area.

**The following information should be found in the 4 quadrants of the cross/slash:**

**Team ID**

**Time & date team left structure**

**Personnel hazards**

**Number victims still inside structure**

(An "X" indicates no victims remaining)

**Left quad.**

**Upper quad.**

**Right quad.**

**Lower quad.**

## Unexploded Ordnance (UXO)

- Recognizing unexploded ordnance (UXO) is the first and most important step in reducing the risk posed by UXO.
- The following types of UXO are most likely to be encountered on military, former military and non-military sites:

Small arms munitions	Hand grenades
Guided missiles	Projected grenades
Rifle grenades	Submunitions
Rockets	Projectiles
Mortars	Bombs
- UXO may be found fully intact or in fragments. All UXO, whether intact or in fragments, presents a potential hazard and should be treated as such.
- Deteriorated UXO presents a particular hazard because it may contain chemical agents that could become exposed.
- **UXO Safety and Reporting.** UXO poses risk of injury or death to anyone in the vicinity.
- If you see UXO, stop. Do not move closer.
- Never transmit radio frequencies (walkie talkies, citizens' band radios).
- Never remove anything near UXO.
- Never touch, move, or disturb UXO.
- Clearly mark the UXO area.
- Avoid any area where UXO is located.
- Keep a minimum of 500 feet away from any UXO that is on fire.
- Report discovery of UXO to your immediate supervisor.

**“IF YOU DIDN’T DROP IT, DON’T PICK IT UP!”**

## Evaluating Search Urgency

<b>FACTOR</b>	<b>RATING</b>
AGE	
Very Young	1
Very Old	1
Other	2-3
MEDICAL CONDITION	
Known/suspected injured, ill or mental problem	1-2
Healthy	3
Known Fatality	3
NUMBER OF SUBJECTS	
One alone	1
More than one (unless separated)	2-3
SUBJECT EXPERIENCE PROFILE	
Inexperienced, does not know area	1
Not experienced, knows area	1-2
Experienced, not familiar with area	2
Experienced, knows area	3
WEATHER PROFILE	
Past and/or existing hazardous weather	1
Predicted hazardous weather (less than 8 hours away)	1-2
Predicted hazardous weather (more than 8 hours away)	2
No hazardous weather predicted	3
EQUIPMENT PROFILE	
Inadequate for environment and weather	1
Questionable for environment and weather	1-2
Adequate for environment and weather	3
TERRAIN/HAZARDS PROFILE	
Known terrain or other hazards	1
Few or no hazards	2-3
TOTAL	

(Range = 7-21, with 7 the highest urgency and 21 the lowest urgency)



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## Patient Assessment

### Patient Information:

- Name
- Sex
- Weight
- Chief complaint
- Date of Birth/Age

### Oriented to:

- Person
- Disoriented
- Purpose
- Time
- Place

### Response to pain:

- Purposeful
- Unconscious
- No response
- Non-purposeful

### Breathing:

- Normal
- Stridor
- RHonchi
- Unequal
- Wheezes
- Other
- Rales
- Apnea

### Skin Vitals:

#### Color

Normal  
Pale/Ashen  
Cyanotic  
Flushed

#### Moisture

Normal  
Dry  
Moist  
Profuse

#### Temperature

Normal  
Hot  
Cool  
Cold

### Pupils:

- P.E.R.L.
- Midpoint
- Pinpoint
- Fixed
- Unequal
- Dilated

### Patient History:

- Hx of complaint
- Diabetes
- COPD
- Other
- Cardiac
- Unknown
- CVA
- No Hx
- Seizure
- Hypertension



## First Aid Guidelines

**LEGALITY:** Do only what you know how to do and keep records of actions.

**BLOODBORN PATHOGENS:** Personal protective equipment (pocket mask, latex gloves and goggles) should be worn if contact with body fluids is possible.

**TREATMENT PRINCIPLES:**

- Think-prevent further injury; remove from danger. No liquids for the unconscious.
- Fast Exam-airway, breathing and circulation.
- Thorough Exam-head to toe and side to side (symmetry).
- Keep readable records and send a copy with the patient when evacuating.

**SPECIFIC TREATMENTS:**

**Bleeding:** Direct pressure, elevate, and pressure point.

**Shock:** Lay patient down, elevate feet, keep warm and replace fluids if conscious.

**Fractures:** Splint joints above and below injury and monitor pulse past injury away from body.

**Bee Sting (anaphylaxis):** Life threatening see if the patient has a sting kit and transport immediately.

**Burns:** Remove heat source, cool with water, dry wrap and replace fluids.

**Diarrhea:** Drink fluids in large quantities.

**Eye injuries:** Wash out foreign material, don't open swollen eyes, leave impaled objects and pad and bandage both eyes.

**Heat exhaustion:** Skin gray, cool and clammy. Rest in cool place and replace electrolytes.

**Heat stroke:** Skin dry, red, temperature hot. Cool and transport immediately.

## **CPR**

**Determine responsiveness** - Gently shake shoulder and shout: "Are you OK?" If no response, call EMS. If alone, call EMS before starting **ABCs**.

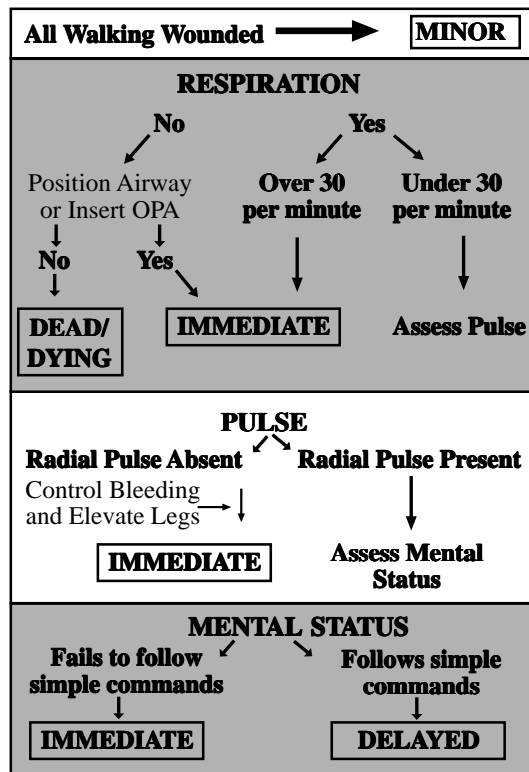
**Airway** - roll victim on back as a unit supporting head and neck. Open airway by head-tilt/chin-lift maneuver. Look, listen and feel for breathing for 3 to 5 seconds. If no response, go to **B**.

**Breathing** - Pinch victim's nose shut. Put mouth over victim's, making a tight seal. Give 2 slow breaths. If chest does not rise, reposition and try again. If breaths still do not go through, use abdominal thrusts to clear airway. If chest does rise, go to **C**.

**Circulation** - Check carotid pulse for 5 to 10 seconds. If there is a pulse but no breathing, give 1 breath every 5 seconds until victim is breathing or help arrives. If no pulse, begin chest compressions.

**One/Two Rescuer CPR** - Perform 15 external chest compressions at the rate of 80 to 100 times per minute to a 1.5 to 2" depth. Reopen airway and give 2 full breaths. After 4 cycles of 15:2 (about 1 minute), check pulse. If no pulse, continue 15:2 cycle beginning with chest compressions until advanced life support is available. If 2 rescuers are available, use a 5:1 compressions to breaths ratio. Use a 5:1 ratio for children and infants with compressions at a rate of 100 times per minute. Use a 1 to 1.5" depth for children and a .5 to 1" depth for infants.

## START Triage



## **Disaster Size-up Information**

### **TRIAGE SYSTEM**

<u>Color</u>	<u>Priority</u>	<u>Description</u>
Red	Immediate	Serious, salvageable, life-threatening injury or medical problem.
Yellow	Delayed	Treatment and transportation can be delayed
Green	Minor	“Walking wounded” whose treatment can be delayed until all others are cared for.
Black	Dead/ dying	Dead or those with grave injuries likely to result in death.

### Burn Injury Treatment

- Remove person from heat source, extinguish with water.
- Provide basic first aid:
  - Maintain airway, breathing, circulation (ABCs)
  - Treat for shock by keeping person warm, feel elevated
  - Provide oxygen, if available trained to administer
- Assess degree of burn and area affected.

**First Degree** - affected skin's outer layer. Redness, mild swelling, tenderness, and mild to moderate pain.

**Second Degree** - extends through entire outer layer and into inner layer of skin. Blisters, swelling, weeping of fluids, and severe pain.

**Third Degree** - extends through all skin layers and into underlying fat, muscle, bone. Discoloration (charred, white or cherry red), leathery, parchment-like, dry appearance. Pain is absent.

**"Rule of Nine"** for determining area burned:

Head	9%	Front Torso	18%
Back Torso	18%	Left Arm	9%
Right Arm	9%	Left Leg	9%
Right Leg	9%	Perineum	1%

- Cut away only burned clothing. DO NOT cut away clothing stuck to burned skin.
- Apply cool, clear water over burned area. DO NOT soak person or use cold water and ice packs. This encourages hypothermia.
- Cover burned area with sterile dressing, moisten with saline solution, and apply dry dressing on top.
- For severe burns or burns covering large area of body -
  - wrap in clean, sterile sheet followed by plastic sheet
  - place inside sleeping bag or cover with insulated blanket
- Monitor ABCs and keep burn areas moist.
- Avoid hypothermia and overheating.

## **Snag Safety**

Environmental conditions that increase snag hazards:

- Strong winds
- Night operations
- Steep slopes
- Diseased or bug-kill areas

Hazard tree indicators:

- Trees have been burning for an extended period
- High risk tree species (rot and shallow root system)
- Numerous down trees
- Dead or broken tops and limbs overhead
- Accumulation of down limbs
- Absence of needles, bark or limbs
- Leaning or hung-up trees

## **Thunderstorm Safety**

Approaching thunderstorms may be noted by a sudden reverse in wind direction, a noticeable rise in wind speed, and a sharp drop in temperature. Rain, hail, and lightning occur only in the mature stage of a thunderstorm.

Observe the 30/30 rule: a) If you see lightning and hear thunderclaps within 30 seconds take storm counter-measures identified below. b) Do not resume work in exposed areas until 30 minutes after storm activity has passed.

- Take shelter in a vehicle or building if possible.
- If outdoors, find a low spot away from tall trees, wire fences, utility lines and other elevated conductive objects. Make sure the place you pick is not subject to flooding.
- If in the woods, move to an area with shorter trees.
- If only isolated trees are nearby, keep your distance twice the tree height.
- If in open country, crouch low minimizing contact with the ground. You can use a pack to sit on, but never lay on the ground.
- If you feel your skin tingle or your hair stand on end, immediately crouch low to the ground. Make yourself the smallest possible target and minimize your contact with the ground.
- Don't group together.
- Don't stay on ridgetops, in wide open areas, near ledges or rock outcroppings.
- Don't operate land line telephones, machinery, or electric motors.
- Don't handle flammable materials in open containers or metal handtools.
- Handheld radios and cellular telephones can be used.



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### **Aviation User Checklist**

- Pilot's Card—qualified and current for aircraft type and mission?
- Aircraft Card—aircraft approved for mission?
- Flight Plan/Following—filed (FAA/Agency/Bureau)?
- Personal Protective Equipment (PPE)—required for missions—available and worn by all passengers and pilot?
- Pilot briefed on Mission Objectives/Parameters of Flight and Known Flight Hazards?
- Pilot briefing to passengers including:
  - Aircraft approach and departure paths
  - Seat belt – use and adjustment
  - Smoking rules
  - Fire extinguisher(s) – location and use
  - Emergency exits – location and use
  - Survival equipment – location and use
  - Oxygen (if available) – location and use
  - ELT – location and use
  - Other emergency procedures, i.e. fuel and electric shut-off
  - Radio operations
  - Equipment or tools – NEVER store under seats while transporting passengers

### **Aviation Watch Out Situations**

- Is this flight necessary?
- Who is in charge?
- Are all hazards identified and have you made them known?
- Should you stop the operation or flight due to change in conditions?  
Communications? Weather?  
Confusion? Turbulence?  
Conflicting Priorities? Personnel?
- Is there a better way to do it?
- Are you driven by an overwhelming sense of urgency?
- Can you justify your actions?
- Are there other aircraft in the area?
- Do you have an escape route?
- Are there any rules being broken?
- Are communications getting tense?
- Are you deviating from the assigned operation or flight?

## **Flight Following**

Flight following, resource tracking, and communications are key components in employee and aircraft mission safety and efficiency. Flight following, whether performed from a dispatch office or other facility, or at a remote location in the field, must be given a high priority by all personnel involved.

### **Identification of flight following requirements:**

At the time the flight is planned, flight following requirements should be clearly identified. Requirements should identify check-in procedures, including time and locations, dispatch office(s) or other flight following facilities involved, individuals responsible for flight following, frequencies to be used, and any special circumstances requiring check-ins (for example, to military facilities within Special Use Airspace).

### **Check-In Requirements:**

Check-in intervals or times must be specified in the agency's flight following procedures. Check-ins must be documented and provide enough information so that the aircraft can be easily located if it is overdue or missing.

### **Failure to Meet Check-In Requirements:**

The dispatch or other flight following facility shall implement response procedures for overdue or missing aircraft.

## **Flight Manager**

The Flight Manager (FM) is supervised by the sending unit dispatcher until destination is reached. The FM is responsible for all personnel assigned on the manifest list. Duties are:

- To explain to all personnel at the beginning of travel, transportation arrangements, type equipment, route of travel, stopping points, ETAs, etc.
- To have multiple copies of manifests covering all personnel.
- To ensure proper flight following procedures are met.
- To have the telephone numbers of the sending and receiving dispatchers' offices when delays of more than 30 minutes occur in order to give information as to why and how long the delay will be.
- To have all personnel within the weight limitations, assembled, ready to board transportation.
- To provide for safety and welfare of each person assigned to the manifest list.
- To ensure saws and other fuel containers are purged prior to loading.
- To ensure no fuel- or lubricant-soaked items including clothing, chaps or bags are transported by aircraft.
- To check pilot card and aircraft data card for currency and qualifications.
- To ensure all passengers arrive at their destination.
- To sign the Daily Flight report/Invoices.
- To ensure all personnel have a copy of their resource order with request number and position assigned.
- For Canadian travel, to ensure proper documentation is included as outlined in the Canadian/United States Operating Agreement (chapter 40).

## Helicopter Passenger Briefing

All passengers must receive a safety briefing prior to flight.

### **PPE - PROPER USE**

- Hardhat/helmet (fitting, chinstrap)
- Nomex clothing (sleeves down, collar up)
- Leather boots and gloves.

### **NORMAL PROCEDURES**

- **Entry and exit of aircraft**
  - Portable radio turned off
  - Approach-Departure (crouch-do not run)
  - Stay away from tail rotor
  - Approach/Exit downslope
  - As directed by pilot/helitack personnel
- **Seating in aircraft**
  - No movement inside aircraft once seated
  - Keep seatbelt fastened
  - Keep gloves and chinstraps on
- **No smoking**
- **Wait for helitack personnel to unload**
  - Leave doors closed
  - Do not unbuckle seatbelt until directed by pilot or helitack personnel
- **Loading/Unloading tools and equipment**
  - Always carry long-handled tools/equipment parallel to ground/never on shoulder
  - Secure any loose items inside cabin
  - All tools and equipment loaded/unloaded by helitack personnel
  - HazMat regulations/precautions

### **EMERGENCY PROCEDURES**

- **Follow directions from pilot/helitack personnel**
- **Location and use of:**
  - Crash positions (demonstrate)
  - Fire Extinguisher
  - Survival Kit
  - Emergency Exits
  - First-Aid Kit
  - ELT/portable radios
- **Depart helicopter only after rotor blades have stopped**

## **Personal Protective Equipment for Flight**

Agencies have personal protective equipment (PPE) requirements for most flights. When in doubt, WEAR IT.

- Above-the-ankle leather boots 8” or higher, and no metal against the skin.
- Nomex pants and shirt or flight suit buttoned or zipped to the top, collar turned up, sleeves rolled down. Pants cover the boot tops.
- Nomex or leather gloves.
- Non-synthetic (cotton, wool) outer and undergarments.
- Approved flight helmet or hard hat with chin strap (hard hats apply only to helicopter crew shuttle operations). Eye protection should be worn during takeoffs and landings. Wear eye protection when working around helicopters.
- Approved hearing protection.

## Helicopter Landing Area Selection

### Choosing a Landing Area:

- Locate a reasonably flat area.
- Choose an area clear of people, vehicles, obstructions such as trees, poles, and especially overhead wires. The area must be free of stumps, brush, posts, large rocks or anything over 18 inches high.
- Consider the wind direction. Helicopters land and take off into the wind. Choose an approach free of obstructions.
- Any obstruction should be relayed to the helicopter crew on initial radio contact.
- Remove or secure any loose items in and around the landing area such as trash, blankets, hats or equipment.
- Wet down the landing area if dusty conditions are present.

### FIXED HELISPOTS

#### Type I Helicopters

- Safety circle 110 feet
- Touchdown pad 30 feet x 30 feet clear and level

#### Type II Helicopters

- Safety circle 90 feet
- Touchdown pad 20 feet x 20 feet clear and level

#### Type III Helicopters

- Safety circle 75 feet
- Touchdown Pad 15 feet x 15 feet clear and level

### ITEMS NEEDED:

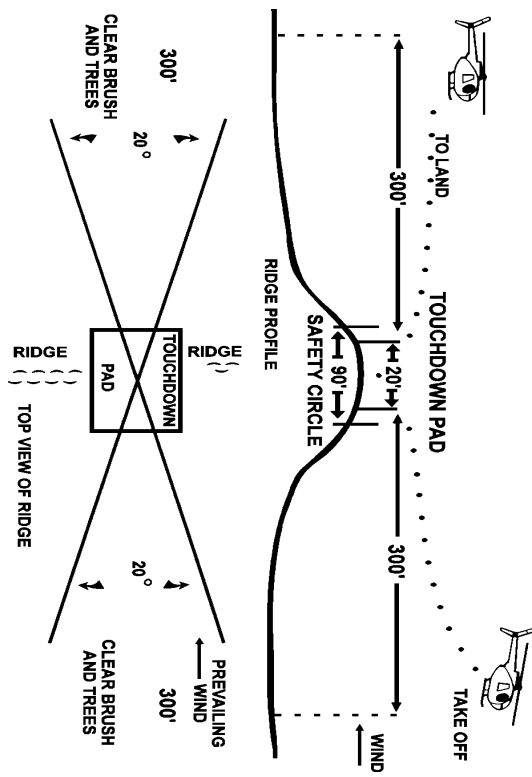
- Twenty (20) lb. fire extinguisher
- Wind Indicator
- Radio-compatible with helicopter
- Pad Marker
- Allowable Payloads (HIGE & HOGE) for all helicopters using helispot
- Passenger/Cargo Manifest Book
- Dust abatement, as needed



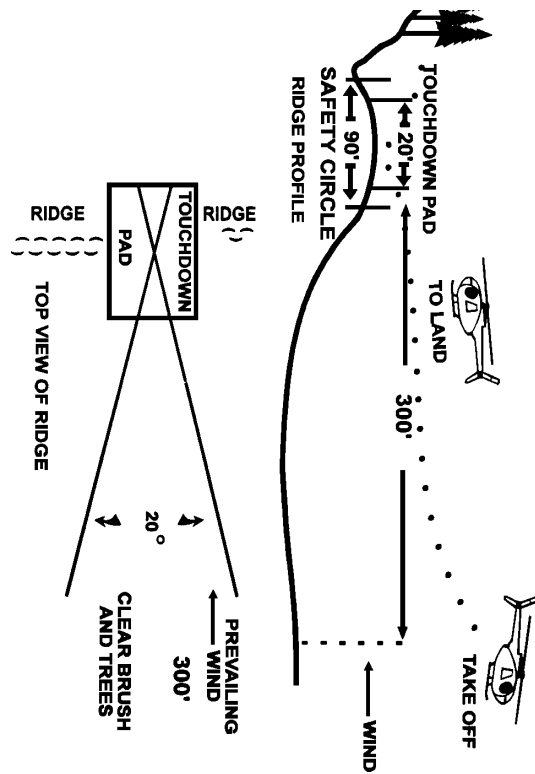
## **Longline Mission**

- All individuals involved in longline missions will be certified annually by an instructor qualified in longline operations.
- If you are on the receiving end or the backhaul end of a longline load, you must be able to communicate to the pilot where you want the load delivered or picked up.
- Use a signal mirror to identify your position to the pilot.
- The drop-off/pick-up area should be as open and free of obstacles as possible. It is extremely difficult to hover straight down between tall trees.
- Once you have contacted the pilot by radio, give him/her all the information you can (cargo weight, wind speed and direction, etc.)
- Mark the drop-off spot with flagging (large “X” on the ground) if possible.
- Keep pilot informed of load status (height above the ground, clear of obstacles, etc.)
- Let the hook land on the ground before attaching load.
- If the electrical release does not release the load, you must manually release it; wait until the hook lands on the ground before releasing.
- For ALL backhaul, a “swivel” must be connected to the cargo/longline hook. NO EXCEPTIONS! (when you request nets, request swivels also).
- Load cargo net with heavy items in the center, light items on top. Tape all boxes and loose items.
- Pull the “purse strings” of the cargo net to equal length and attach a swivel to the steel rings. It’s not necessary to “cross” the purse strings with an overhand wrap. The preferred method is to make an oversized collar out of fiber tape that will slip down the purse strings as the load is lifted.

## Two-Way Helispot



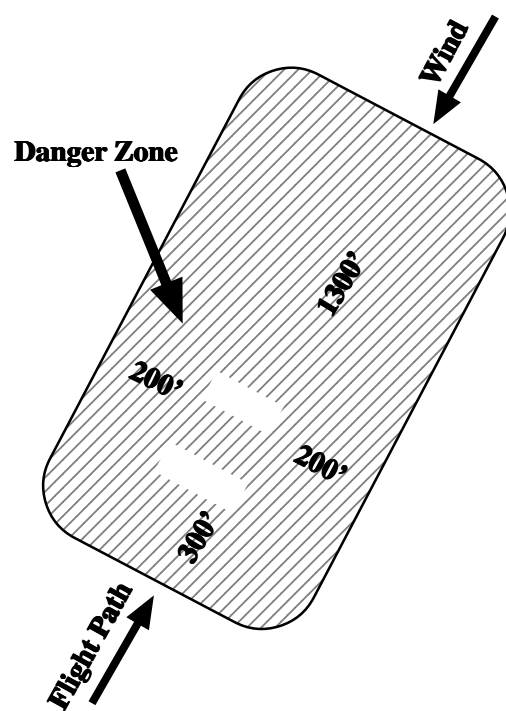
## One-Way Helispot



## Helicopter Hand Signals



### Paracargo Drop Zone



## **Paracargo and Aerial Retardant Operations Safety**

The paracargo danger zone is a strip of 200 feet on each side of the flight path, 300 feet in the direction of approach, and 1300 feet in the direction of the aircraft when it leaves the target. The following should be observed at all times:

- Mark target area with white or orange “T” in open or cleared area with top of “T” into the wind. Erect paper streamer or flagging on long pole to indicate wind direction.
- An individual should be in charge at drop site.
- All persons, vehicles, and animals should be cleared from the danger zone prior to arrival of the cargo aircraft.
- Camps should be at least 600 feet from target area and outside of danger zone.
- Allow no one in danger zone until drop is complete.
- Beware of “streamers” or parachutes that don’t open.

Personnel can be injured by the impact of material dropped by aircraft. Clear personnel out of target area when drop is to be made. If you can’t escape:

- Hold your handtool away from your body.
- Lie face down with head toward oncoming aircraft and hardhat in place. Grasp something firm to prevent being carried or rolled about by the dropped liquid.
- Do not run unless escape is assured.
- Get clear of dead snags, tops and limbs in drop area.
- Working in an area covered by wet retardant should be done with caution due to slippery surfaces.

### **Weight Estimates**

(use only if scale is not available)

<u>Item</u>	<u>Weight</u>
Blevet bag	15 lbs.
Backpack pump (full)	45 lbs.
Cargo net 12x12	20 lbs.
Cargo net 20x20	45 lbs.
Cargo net (fish net)	5 lbs.
Cargo hook (1 hook)	35 lbs.
Jerry can/fuel (5 gal.)	45 lbs.
Canteen (1 gal.)	10 lbs.
Dolmar (full)	15 lbs.
Drip torch (full)	15 lbs.
Fusee (1 case)	36 lbs.
Hand tool (each)	8 lbs.
Lead line (12 ft.)	10 lbs.
Long line (50 ft.)	30 lbs.
Swivel	5 lbs.
Chainsaw	25 lbs.
Hose, 1 1/2" SYN. 100'	23 lbs.
Hose, 1" SYN. 100'	11 lbs.
Hose, 3/4" SYN (1000'/case)	30 lbs.
Hose, suction, 8 ft.	10 lbs.
Mark 3 - Pump w/kit	150 lbs.
Stokes w/ backbrd.	40 lbs.
Trauma bag	35 lbs.
M.R.E., 1 case	25 lbs.
Cubee/water (5 gal.)	40 lbs.

### **Principles of Retardant Application**

- Determine tactics direct or indirect based on fire size-up and resources available.
- Establish an anchor point and work from it.
- Use the proper drop height.
- Apply proper coverage levels. (See next page.)
- Drop downhill and down-sun when feasible.
- Drop into the wind for best accuracy.
- Maintain honest evaluation and effective communication between the ground and air.
- Use direct attack only when ground support is available or extinguishment is feasible.
- Plan drops so they can be extended or intersected effectively.
- Monitor retardant effectiveness and adjust its use accordingly.



## Directing Retardant and Bucket Drops

- **Give general location** on incident.
- **Finalize location** with:
  - Clock direction - straight in front of the aircraft is 12 o'clock, out the right door is 3 o'clock, the tail is 6 o'clock, and the left door is 9 o'clock. When giving directions, remember that helicopters and air attack generally orbit in a right-hand pattern and air tankers in a left-hand pattern.
  - Position on slope - lower 1/3, upper 1/3, midslope, top of ridge, etc.
  - Aspect - direction slope is facing.
  - Describe prominent landmarks - don't say "I have a red hardhat, I'm wearing a yellow shirt, I'm waving, I'm by the big rock, "etc." Visualize what the pilot sees from the air and describe target.
  - Use signal mirrors - use smoke or fusee if mirror unavailable. Stand in drop location (when safe) for ID and move away before drop.
- **Describe target** from your location and explain mission. The pilot will decide drop technique and flight path.
- **Assure pilot** all personnel are safe and know aircraft intentions before the drop.
- **Give feedback** to pilot about drop accuracy. Be honest and constructive. Let pilot know if drop is early, late, uphill, downhill, on target, too high, too low, etc. Report low drops immediately.

## Recommended Retardant Coverage Levels

Fuel Model NFDRS	FB	Coverage Level (gal/100ft <sup>2</sup> )	Flow Rate Range (gal/sec)	Description
A.L.S.	1	1	100-150	Annual & perennial western grasses: tundra
C	2			Conifer with grass
H.R.	8	2	151-250	Shornecdele closed conifer: summer hardwood
E.P.U.	9			Longneecdele conifer: fall hardwood
T	2			Sagebrush with grass
N	3	3	251-400	Sawgrass
F	5			Intermediate brush (green)
K	11			Light slash
G	10	4	401-600	Shornecdele conifer (heavy dead litter)
O		6	601-800	Southern rough
F.O.	6			Intermediate brush (cured): Alaska Black Spruce
B.O.	4	Greater	Greater	California mixed chaparral: high pccosin
J	12	than 6	than 800	Medium slash
I	13			Heavy slash

## **Aircraft Mishap Response Actions**

Time is extremely critical when responding to an emergency. Immediate positive action is necessary; delay may effect someone's survival.

### **Rescue Operations**

- Preserve life.
- Secure the area (deny access except to credentialed and escorted media).
- Do whatever is necessary to extricate injured occupants, and to extinguish fires, keeping in mind the necessity of protecting and preserving evidence.
- Document and/or photograph the location of any debris which must be disturbed in order to carry out rescues and/or fire suppression activities.

### **Site Safety Precaution**

Aircraft wreckage sites can be hazardous for many reasons other than adverse terrain or climatic conditions. Personnel involved in the recovery, examination, and documentation of wreckage may be exposed to physical hazards posed by such as hazardous cargo, flammable and toxic fluids, sharp or heavy objects, and disease. It's important to exercise good judgment, use available protective devices and clothing, and use extreme caution when working in the wreckage. Do not exceed your physical limitations.

### **Reportable Safety Concerns**

If a situation appears unsafe, discuss your concern with the pilot, or immediately contact your dispatcher or agency aviation representative for assistance.

Any safety concern should be documented on a SAFECOM and forwarded through agency channels. A SAFECOM is used to report any condition, observance, act, maintenance problem, or circumstance that has the potential to cause an aviation-related mishap. This type of follow-up helps improve overall aviation safety.

If the mishap involves damage or injury, notify the Agency's Aviation Safety Office (ASO) immediately by the most expeditious means available.

**USDA-FS/USDI-OAS**  
**24-Hour accident Reporting Hot Line**  
**Dial 1-888-464-7427 or 1-888-4MISHAP**

**OAS Web Site - [www.oas.gov](http://www.oas.gov)**

## USFS Visual Signal Code

### Ground To Air

Require doctor, serious injury	—
Able to ride horse	<u>2</u>
Need stretcher crew	<u>3</u>
Broken leg	<u>4</u>
Broken arm	<u>5</u>
Broken back	<u>6</u>
Head injury	±
Puncture wound	8
Unable to diagnose	9
Jumper OK	L
Personnel OK	LL
Fire adequately staffed	≡
Change jump spot	J
Cargo drop target	T
Helicopter landing spot	H
Need cross-cut saw	S
Need power saw	SS
Need climbers	O
Need drinking water	U
Need food	F
Need radio with batteries	R
Need batteries for radio	RR
Need power pump outfit	PP
Received message	Wave streamer

### Air to Ground

Received message	Rock plane
Fire here	Circle three times over spot
Will drop message	Gun motor three times

**NOTES**

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<b>R.H. %</b>	<b>1-HR F.M. %</b>	<b>10-HR F.M.%</b>	<b>Relative ease of chance ignition and spotting; general burning conditions</b>
>60	>20	>15	Very little ignition; some spotting may occur with winds above 9 mi./h.
45-60	15-19	12-15	Low ignition hazard--campfires become dangerous; glowing brands cause ignition when relative humidity is <50 percent.
30-45	11-14	10-12	Medium ignitability--matches become dangerous; "easy" burning conditions.
26-40	8-10	8-9	High ignition hazard--matches always dangerous; occasional crowning, spotting caused by gusty winds; "moderate" burning conditions.
15-30	5-7	5-7	Quick ignition, rapid buildup, extensive crowning; any increase in wind causes increased spotting, crowning, loss of control; fire moves up bark of trees igniting aerial fuels; long distance spotting in pine stands; dangerous burning conditions.
<15	<5	<5	All sources of ignition dangerous; aggressive burning, spot fires occur often and spread rapidly, extreme fire behavior probable; critical burning conditions.



## Relative Humidity - 1400-5000' Elevation

Relative Humidity, Percent

DRY BULB	WET BULB DEPRESSION, DEGREES F.																BELT WEATHER KIT RELATIVE HUMIDITY TABLES
	1°F	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
34	91 82 73 64	55 46 38 30	21 13	5													This table for Elevations 1400 to 5000 feet ATMOSPHERIC PRESSURE...29 IN.
35	91 82 74 65	56 48 40 32	24 16	8 0													
36	91 83 75 66	58 50 42 34	26 18	10 3													
37	92 84 75 67	59 51 43 35	28 20	13 5													
38	92 84 76 68	61 53 45 37	30 22	15 8													
39	92 84 76 69	62 54 47 39	32 24	17 10													
40	92 84 77 69	62 55 48 41	33 26	19 13													
41	92 85 77 70	63 56 49 42	35 28	22 15	8 2												WET BULB DEPRESSION, DEGREES F. 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
42	92 85 78 71	64 57 50 44	37 30	24 17	11 4												
43	92 86 78 71	65 58 51 45	38 32	26 19	13 7 1												
44	93 86 79 72	66 59 52 46	40 33	27 21	15 9 3												
45	93 86 79 72	66 60 53 47	41 35	29 23	17 11 5												
46	93 86 80 73	67 60 54 48	42 36	30 24	19 13 8 2												
47	93 86 80 74	67 61 55 49	43 37	32 26	20 15 10 4												
48	93 87 80 74	68 62 56 50	44 39	33 27	22 17 11 6	1											
49	93 87 81 74	69 63 57 51	45 40	34 29	24 18 13 8	3											
50	94 87 81 75	69 63 57 52	46 41 35 30	25 20 15 10	5 0												
51	94 88 82 76	70 64 58 53	47 42 37 31	26 21 17 12	7 2												
52	94 88 82 76	70 65 59 53	48 43 38 33	28 23 18 13	9 4												
53	94 88 82 76	71 65 60 54	49 44 39 34	29 24 20 15	10 6 2												
54	94 88 82 77	71 66 60 55	50 45 40 35	30 26 21 17	12 8 3												
55	94 88 82 77	72 66 61 56	51 46 41 36	31 27 23 18	14 9 5 1												
56	94 89 83 77	72 67 62 57	52 47 42 37	33 28 24 20	15 11 7 3												
57	94 89 83 78	72 67 62 57	52 48 43 38	34 30 25 21	17 12 8 4	0											
58	94 89 83 78	73 68 63 58	53 49 44 39	35 31 27 22	18 14 10 6	2											
59	95 89 84 78	74 68 64 59	54 49 45 40	36 32 28 24	19 15 11 8	4 0											
60	95 89 84 79	74 69 64 59	55 50 46 41	37 33 29 25	21 17 13 9	5 2											
61	95 90 84 79	74 69 65 60	55 51 46 42	38 34 30 26	22 18 14 11	7 3											
62	95 90 84 79	75 70 65 61	56 52 47 43	39 35 31 27	23 19 16 12	8 5 1											
63	95 90 85 80	75 70 66 61	57 52 47 44	40 36 32 28	24 21 17 13	10 6 3											
64	95 90 85 80	75 71 66 62	57 53 49 45	41 37 33 29	26 22 18 15	11 8 5 1											
65	95 90 85 80	76 71 67 62	58 54 50 46	42 38 34 30	27 23 19 16	12 9 6 3											
66	95 90 85 81	76 72 67 63	59 54 50 46	42 39 35 31	28 24 21 17	14 11 7 4	1										
67	95 90 85 81	76 72 68 63	59 55 51 47	43 40 36 32	29 25 22 18	15 12 9 6	3										
68	95 90 86 81	77 72 68 64	60 56 52 48	44 40 37 33	30 26 23 20	16 13 10 7	4 1										
69	95 91 86 81	77 73 68 64	60 56 52 49	45 41 38 34	31 27 24 21	17 14 11 8	5 2										
70	95 91 86 82	77 73 69 65	61 57 53 49	46 42 39 35	32 28 25 22	19 16 13 10	7 4 1										
71	95 91 86 82	77 73 69 65	61 57 54 50	46 43 39 36	32 29 26 23	20 17 14 11	8 5 2										
72	95 91 86 82	78 74 70 66	62 58 54 50	47 44 40 37	33 30 27 24	21 18 15 12	9 6 4 1										
73	95 91 87 82	78 74 70 66	62 59 55 51	48 44 41 38	34 31 28 25	22 19 16 13	10 8 5 2										
74	95 91 87 83	78 74 70 66	63 59 55 52	48 45 42 38	35 32 29 26	23 20 17 14	12 9 6 4	1									
75	96 91 87 83	79 75 71 67	63 59 56 52	49 46 42 39	36 33 30 27	24 21 18 15	13 10 7 5	2									
76	96 91 87 83	79 75 71 67	64 60 56 53	50 46 43 40	37 34 30 27	25 22 19 16	14 11 9 6	4 1									
77	96 91 87 83	79 75 71 68	64 60 57 53	50 47 44 40	37 34 31 28	25 23 20 17	15 12 10 7	5 2									
78	96 91 87 83	79 75 72 68	64 61 58 54	51 47 44 41	38 35 32 29	26 24 21 18	16 13 11 8	6 4 1									
79	96 92 88 84	80 76 72 68	65 61 58 54	51 48 45 42	39 36 33 30	27 25 22 19	17 14 12 9	7 5 2									
80	96 92 88 84	80 76 72 69	65 62 58 55	52 49 45 42	39 36 34 31	28 26 23 20	18 15 13 10	8 6 4									
81	96 92 88 84	80 77 73 69	66 62 59 56	53 50 47 44	41 38 35 32	30 27 24 22	20 17 15 13	10 8 6									
82	96 92 88 84	81 77 74 70	67 63 60 57	54 51 48 45	42 39 36 34	31 29 26 24	21 19 17 14	12 10 8									
86	96 92 88 85	81 77 74 71	67 64 61 58	55 52 49 46	43 40 38 35	33 30 28 25	23 21 18 16	14 12 10									
88	96 92 89 85	81 78 75 71	68 65 62 59	56 53 50 47	44 42 39 36	34 31 29 27	24 22 20 18	16 14 12									
90	96 92 89 85	82 78 75 72	68 65 62 59	56 54 51 48	45 43 40 38	35 33 30 28	26 24 21 19	17 15 13									
92	96 92 89 85	82 79 75 72	69 66 63 60	57 54 52 49	46 44 41 39	36 34 32 29	27 25 23 21	19 17 15									
94	96 93 89 86	82 79 76 73	69 66 64 61	58 55 52 50	47 45 42 40	37 35 33 31	28 26 24 22	20 18 16									
96	96 93 89 86	83 79 76 73	70 67 64 61	59 56 53 51	48 46 43 41	38 36 34 32	30 28 26 24	22 20 18									
98	96 93 90 86	83 80 77 74	71 68 65 62	59 57 54 51	49 46 44 42	39 37 35 33	31 29 27 25	23 21 19									
100	96 93 90 86	83 80 77 74	71 68 65 63	60 57 55 52	50 47 45 43	40 38 36 34	32 30 28 26	24 22 21									
102	97 93 90 87	83 80 77 74	71 69 66 63	61 58 55 53	50 48 46 44	41 39 37 35	33 31 29 27	25 23 22									
104	97 93 90 87	84 81 78 75	72 69 66 64	61 59 56 54	51 49 47 44	42 40 38 36	34 32 30 28	26 25 23									
106	97 93 90 87	84 81 78 75	72 70 67 64	62 59 57 54	52 50 47 45	43 41 39 37	35 33 31 29	28 26 24									
108	97 93 90 87	84 81 78 75	73 70 67 65	62 60 57 55	53 50 48 46	44 42 40 38	36 34 32 30	29 27 25									
110	97 94 90 87	84 81 79 76	73 70 68 65	63 60 58 56	53 51 49 47	45 43 41 39	37 35 33 31	29 28 26									

# Relative Humidity - 5000-9200' Elevation

Relative Humidity, Percent

DRY BULB	WET BULB DEPRESSION, DEGREES F.																BELT WEATHER KIT			
																	RELATIVE HUMIDITY TABLES			
1° F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
34	92 84 75 67	59 51 43 35	28 21 13																	
35	92 84 76 68	60 52 45 37	30 23 16	9	2															
36	92 84 77 69	61 54 46 39	32 25 18	11	4															
37	93 85 78 70	63 55 48 41	34 27 20	13	7	0														
38	93 85 78 71	64 57 49 42	36 29 22	16	9	3														
39	93 85 78 71	65 57 51 44	37 31 24	18	12	5														
40	93 85 79 72	65 58 52 45	39 32 26	20	14	8	2													
41	93 86 79 72	66 59 53 47	41 34 28	22	16	10	4													
42	93 86 80 73	67 60 54 48	42 36 30	24	18	12	6	1												
43	93 87 80 73	67 61 55 49	43 37 31	26	20	14	8	3												
44	93 87 80 74	68 62 56 50	44 39 33	27	22	16	11	5												
45	94 87 81 74	68 62 57 51	45 40 34	28	24	18	13	7												
46	94 87 81 75	69 63 57 52	46 41 35	30	25	20	15	9	4											
47	94 87 81 75	70 64 58 53	47 42 37	31	26	21	17	11	6	2										
48	94 88 82 76	70 65 59 54	48 43 38	32	27	22	18	13	9	4										
49	94 88 82 76	71 66 60 54	49 44 39	34	29	24	20	15	10	6	1									
50	94 88 82 77	71 66 60 55	50 45 40	35	30	26	21	17	12	8	3									
51	94 88 83 77	72 66 61 56	51 46 41	36	32	27	23	18	14	9	5	1								
52	94 89 83 78	72 67 61 57	52 47 42	37	33	28	24	20	15	11	7	3								
53	94 89 83 78	72 67 62 57	52 48 43	38	34	29	25	21	17	13	9	5	1							
54	94 89 83 78	73 68 63 58	53 48 44	39	35	31	26	22	18	14	10	6	2							
55	95 89 84 78	73 69 63 59	54 49 45	40	36	32	28	24	20	16	12	8	4	0						
56	95 89 84 79	74 69 64 59	55 50 46	41	37	33	29	25	21	17	13	9	6	2						
57	95 89 84 79	74 69 65 60	55 51 47	42	38	34	30	26	22	18	14	11	7	3						
58	95 89 84 79	74 70 65 61	56 52 48 43	43	39	35	31	27	23	20	16	12	9	5	2					
59	95 90 85 80	75 70 65 61	57 53 48 44	44	40	36	32	28	24	21	17	14	10	6	3					
60	95 90 85 80	75 71 66 62	57 53 49 45	45	41	37	33	29	26	22	18	15	11	8	5	1				
61	95 90 85 80	75 71 66 62	58 54 50 46	46	42	38	34	30	27	23	20	16	13	9	6	3				
62	95 90 85 81	76 72 67 63	59 54 50 46	47	43	39	35	31	28	24	21 17	14	11	8	4	1				
63	95 90 85 81	76 72 67 63	59 55 51 47	48	44	40	36	32	29	25	22 19	15	12	9	6	3				
64	95 90 85 81	77 72 68 64	60 56 52 48	49	45	41 37	33	30	26	23 20	16	13	10	7	4	1				
65	95 91 86 81	77 73 69 64	60 56 52 49	50	46	42 38	34	31	27	24 21	18	15	12	9	6	4				
66	95 91 86 82	77 73 69 65	61 57 53 49	51	47	43 39	35	32	28	25 22	19	16	13	10	7	5				
67	95 91 86 82	77 73 69 65	61 57 54 50	52	48	44 40	36	33	29	26 23	20	17	14	11	8	5				
68	95 91 86 82	78 74 70 66	62 58 54 50	53	49	45 41	37	34	30	27 24	21	18	15	12	9	7	4	1		
69	95 91 86 82	78 74 70 66	62 58 55 51	54	50	46 42	38	35	31 28	28	25	22	19	16	13	10	8	5	3	0
70	96 91 87 83	79 75 71 67	63 59 56 52	55	51 48	43	40	36	33	30 27	24	21 18	15	12	9	7	5	3	0	
71	96 91 87 83	79 75 71 67	64 60 56 53	56	52 49	44	41 37	34	31	31 28	25	22 19	16	13	10	8	6	4		
72	96 91 87 83	79 75 71 68	64 60 57 53	57	53 50	45	42 38	35	32 29	32	29	26	23 20	17	14	11	9	6	4	
73	96 91 87 83	79 75 72 68	64 61 57 54	58	54 51 48	43	40	36	33 30	33	30	27	24 21	18	15	12	9	7	5	3
74	96 91 87 83	80 76 72 68	65 61 58 55	59	55 52 49	44	41 38	35	32 29	34	31 28	25 22	20 17	14	11	9	6	4		
75	96 91 87 83	80 76 72 68	65 61 58 55	60	56 53 50	45	42 39	36	33 30	35	32 29	26 23	20 17	14	11	10	7	5	3	
76	96 92 88 84	80 76 72 69	65 62 58 55	61	57 54 51	46	43 40	37	34 31	36	33 30	27 24	21 18	15	12	10	8	6	4	
77	96 92 88 84	80 76 72 69	66 62 59 55	62	58 55 52	47	44 41 38	35	32 29	37	34 31	28 25	22 19	16	13	11	9	7	5	
78	96 92 88 84	80 76 73 69	66 62 59 56	63	59 56 53	48	45 42 39	36	33 30	38	35 32	29 26	23 20	17	14	12	10	8	6	
79	96 92 88 84	80 77 73 70	66 63 60 56	64	60 57 54	49	46 43 40	37	34 31	39	36 33	30 27	24 21	18	15	13	11	9	7	
80	96 92 88 84	80 77 73 70	67 63 60 57	65	61 58 55	50	47 44 41	38	35 32	40	37 34	31 28	25 22	19	16	14	12	10	8	
82	96 92 88 85	81 77 74 71	67 64 61 58	66	62 59 56	51 49	46 43 40	39	36 33	41	38 35	32 29	26 23	20 17	14	12	11	10	8	
84	96 92 89 85	81 78 74 71	68 65 61 58	67	63 60 57	52 50	47 44	40	37 34	42	39 36	33 30	29 26	23 20	17	14	12	11	9	
86	96 92 89 85	81 78 75 72	68 65 62 59	68	64 61 58	53 51 48	45 42 39	41	38 35	43	40 37	34 31	29 27	24 22	19	16	14	12	10	
88	96 92 89 85	81 78 75 72	69 66 62 59	69	65 62 59	54 52 49	46 43 40	42	39 36	44	41 38	35 32	30 28	26 23	20 17	15	13	11	9	
90	96 93 89 86	82 79 75 73	69 66 63 61	70	66 63 60	55 53 50	47 44 41	43	40 37	45	42 39	36 33	31 29	27 24	22 19	16	14	12	10	
92	96 92 89 86	83 79 76 73	70 67 64 61	71	67 64 61	58 56 53 51	48 45 42	44	41 38	46	43 40	37 34	32 29	27 24	22 19	17	15	13	11	
94	96 93 89 86	83 80 76 73	70 67 65 62	72	68 65 62	59 57 54	49 46 43	45	42 39	47	44 41	38 35	33 30	28 25	24 21	18	15	13	11	
96	96 93 90 86	83 80 77 74	71 68 65 62	73	69 66 63	60 58 55 53	50 47 45	46	43 40	48	45 42	39 36	34 31	30 27	25 22	20	17	15	13	
98	97 93 90 87	83 80 77 74	71 68 66 63	74	70 66 63	60 58 55 53	51 48 45	47	44 41	49	46 43	39 36	35 32	31 28	26 23	21 18	16	14	12	
100	97 93 90 87	84 81 78 75	72 69 67 64	75	71 67 64	61 59 56 54	49 46 43	48	45 42	50	47 44	40 37	36 33	32 29	27 24	22 19	17	15	13	
102	97 93 90 87	84 81 78 75	72 69 67 64	76	72 68 65	62 60 56 54	51 48 45	49	46 43	51	48 45	41 38	37 34	33 30	28 25	24 21	18	16	14	
104	97 93 90 87	84 81 78 75	72 70 67 65	77	73 69 66	62 60 57 55	52 49 46	50	47 44	52	49 46	42 39	38 35	34 31	30 27	25 22	19	17	15	
106	97 94 91 88	85 82 79 76	74 71 68 66	78	74 71 68	63 61 58 56	53 51 48	51	48 45	53	50 47	43 40	39 36	36 33	33 30	28 25	24 21	19	17	

## Windspeed Ranges

Frontal winds ..... Too broad a range to be specific.  
 Foehn ..... 40 to 60 mi/hr common; up to 90 mi/hr reported at 20 ft.  
 Land breeze ..... 2 to 3 hours after sunset, 3 to 5 mi/hr at 20 ft.  
 Pacific sea breeze ..... 10 to 15 mi/hr at 20 ft.  
 Up-valley winds . 10 to 15 mi/hr, early afternoon and evening at 20 ft.  
 Upslope winds ..... as high as 4 to 8 mi/hr at midflame height.  
 Downslope winds ..... 3 to 6 mi/hr at midflame height.

BEAUFORT SCALE FOR ESTIMATING 20-FT WINDSPEED		
Wind Class	Wind Speed (mph)	Nomenclature
1	<3	Very light - smoke rises nearly vertically. Leaves of quaking aspen in constant motion; small branches of bushes sway; slender branches and twigs of trees move gently; tall grasses and weeds sway and bend with wind; wind vane barely moves.
2	4-7	Light - trees of pole size in the open sway gently; wind felt distinctly on face; loose scraps of paper move; wind flutters small flag.
3	8-12	Gentle breeze - trees of pole size in the open sway very noticeably; large branches of pole size trees in the open toss; tops of trees in dense stands sway; wind extends small flag; a few crested waves form on lakes.
4	13-18	Moderate breeze - trees of pole size in the open sway violently; whole trees in dense stands sway noticeable; dust is raised on the road.
5	19-24	Fresh - branchlets are broken from trees; inconvenience is felt in walking against wind.
6	25-31	Strong - tree damage increases with occasional breaking of exposed tops and branches; progress impeded when walking against wind; light structural damage to buildings.
7	32-38	Moderate gale - severe damage to tree tops; very difficult to walk into wind; significant structural damage occurs.
8	>39	Fresh gale - surfaced strong Santa Ana; intense stress on all exposed objects, vegetation, buildings; canopy offers virtually no protection; wind flow is systematic in disturbing everything in its path.
Source: Fire Behavior Field Reference		

## **Line Spike**

The “Line Spike,” or “Coyote,” is a progressive line construction technique in which self-sufficient crews build fireline until the end of an operational period, remain overnight (RON) at or near that point, and then begin again the next operational period. Crews should be properly equipped and prepared to spend two or three shifts on the line with minimal support from the incident base.

### **Safety Considerations**

- Can line spike locations maintain LCES at all times?
- Can emergency medical technicians be on the line?
- Can a timely medivac plan be implemented?
- Can daily communications (verbal and written) be maintained?
- Can food and water be provided daily?
- Is each crew boss comfortable with the assignment?

### **Operational Considerations**

- Meals during line spike operational periods may consist of rations and/or sack lunches.
- The line spike generally will not last more than two or three operational periods for any one crew.
- Division supervisors will be responsible for establishing on and off operational period times.
- Crews working line spike operational periods will be re-supplied on the fireline as close as possible to the RON point.

## **Line Spike (continued)**

### **Logistical Considerations:**

- Bringing toothbrush/paste, extra socks/underwear, light coat, double lunch, space blanket, etc.
- Considering early in the operational period where the crew(s) will RON, and that the location provides for safety and logistical needs of the crew; i.e., main fire poses no threat, helicopters can long-line or land at site, personnel are provided semi-flat ground to sleep on, adequate firewood exists for warming fires, etc.
- Anticipating re-supply needs and placing those orders early in the operational period. Crew leaders should make arrangements to have qualified individuals at RON locations to accept those orders by long-line or internal helicopter operations.
- Taking measures to prevent problems with food, trash, etc. in areas where bears are a concern. It's a common practice to leave one or more individuals with radio communications at the RON location to coordinate the "back haul" of trash or the pre-positioning of reusable supplies to advanced RON locations.
- How crew time and commissary items will be managed. Normally this function can be provided by using in-/out-bound helicopter flights at the RON location, or the time is turned in upon returning to the incident base.
- How medical emergencies will be managed. An emergency medical technician may be needed at the RON location.

## **Minimum Impact Suppression Tactics**

The intent of minimum impact suppression tactics is to suppress a wildfire with the least impact to the land. Fire conditions and good judgment dictate the actions taken. Consider what is necessary to halt fire spread and contain it within the fireline or designated perimeter boundary.

### **A. Safety**

- **Safety is of utmost importance.**
- **Constantly review and apply the “Watch Out Situations” and “Fire Orders.”**
- **Be particularly cautious with:**
  - Unburned fuel between you and the fire.
  - Burning snags allowed to burn.
  - Burning or partially burned live and dead trees.
- **Be constantly aware of surroundings, expected fire behavior, and possible fire perimeter 1 or 2 days hence.**

### **B. Fire Lining Phase**

- **Select procedures, tools, equipment that least impact the environment.**
- **Seriously consider using water as a firelining tactic (fireline constructed with nozzle pressure, wetlining).**
- **In light fuels, consider:**
  - Cold-trail line.
  - Allowing fire to burn to natural barrier.
  - Burning-out and use of “gunny” sack or swatter.
  - Constantly rechecking cold-trailed fireline.
  - If constructed fireline is necessary, using minimum width and depth to check fire spread.

## Minimum Impact (continued)

- **In medium/heavy fuels, consider:**
  - Using natural barriers and cold-trailing.
  - Cooling with dirt and water, and cold-trailing.
  - If constructed fireline is necessary, using minimum width and depth to check fire spread.
  - Minimizing bucking to establish fireline. Preferably move or roll downed material out of the intended constructed fireline area. If moving or rolling out is not possible, or the downed log/bole is already on fire, build line around and let material be consumed.
- **Aerial fuels -- brush, trees, and snags:**
  - Adjacent to fireline: Limb only enough to prevent additional fire spread.
  - Inside fireline: Remove or limb only those fuels that if ignited would have potential to spread fire outside the fireline.
  - Brush or small trees that are necessary to cut during fireline construction will be cut flush with the ground.
- **Trees, burned trees, and snags:**
  - MINIMIZE cutting of trees, burned trees, and snags.
  - Live trees will not be cut, unless determined they will cause fire spread across the fireline or endanger workers. If tree cutting occurs, cut the stumps flush with the ground.
  - Scrape around tree bases near fireline if hot and likely to cause fire spread.
  - Identify hazardous trees with either an observer, flagging, and/or glow-sticks.
- **When using indirect attack:**
  - Do not fall snags on the intended unburned side of the constructed fireline, unless they are a safety hazard to crews.
  - On the intended burn-out side of the line, fall only those snags that would reach the fireline should they burn and fall over. Consider alternative means to falling, i.e., fireline explosives, bucket drops.
  - Review items listed above (aerial fuels; brush, trees, and snags).

## **Minimum Impact (continued)**

### **C. Mop-Up Phase**

- **Consider using “hot-spot” detection devices along perimeter (aerial or hand-held).**
- **Light fuels:**
  - Cold-trail areas adjacent to unburned fuels.
  - Do minimal spading; restrict spading to hot areas near fireline.
  - Use extensive cold-trailing to detect hot areas.
- **Medium and heavy fuels:**
  - Cold-trail charred logs near fireline; do minimal scraping or tool scarring.
  - Minimize bucking of logs to check for hot spots or extinguish fire; preferably roll the logs and extinguish the fire.
  - Return logs to original position after checking or ground is cool.
  - Refrain from making boneyards; burned/partially burned fuels that were moved should be arranged in natural position as much as possible.
  - Consider allowing larger logs near the fireline to burnout, instead of bucking into manageable lengths. Use lever, etc., to move large logs.
- **Aerial fuels – brush, small trees, and limbs.**
  - Remove or limb only those fuels that if ignited, have potential to spread fire outside the fireline.
- **Burning trees and snags.**
  - See Section B



## Line Production Rates for Initial Action in Chains per Person per Hour

NOTE: Use these rates to estimate initial action productivity. Do not use these rates to estimate sustained line construction, burnout, or holding productivity. Initial action may consist of scratch line construction and hotspotting.

Fire Behavior Fuel Model	Specific Conditions	Construction Rate in Chains per person per hour
1 Short grass	Grass Tundra	4.0 1.0
2 Open timber/ Grass understory	All	3.0
3 Tall grass	All	0.7
4 Chaparral	Chaparral High pocosin	0.4 0.7
5 Brush	All	0.7
6 Dormant brush/ Hardwood slash	Black spruce Others	0.7 1.0
7 Southern rough	All	0.7
8 Closed timber litter	Conifers Hardwoods	2.0 10.0
9 Hardwood Litter	Conifers Hardwoods	2.0 8.0
10 Timber (litter & understory)	All	1.0
11 Logging slash, light	All	1.0
12 Logging slash, medium	All	1.0
13 Logging slash, heavy	All	0.4

### Line Production Rates for Initial Action by Engine Crews in Chains per Crew per Hour

NOTE: Use these rates to estimate initial action productivity. Do not use these rates to estimate sustained line construction, burnout, or holding productivity. Initial action may consist of scratch line construction and hotspotting.

Fire Behavior Fuel Model	Specific Conditions	Chains per Crew Hour				
		Number of Persons in Crew				
		1	2	3	4	5+
1 Short grass	Grass Tundra	6 2	12 8	24 15	35 24	40 30
2 Open timber/ grass understory	All	3	7	15	21	25
3 Tall grass	All	2	5	10	14	16
4 Chaparral	Chaparral High pocosin	2 2	3 4	8 10	15 15	20 18
5 Brush (2 ft.)	All	3	6	12	16	20
6 Dormant brush/ Hardwood slash	Black Spruce Others	3 3	6 6	10 12	16 16	20 20
7 Southern rough	All	2	5	12	16	20
8 Closed timber litter	Conifers Hardwoods	3 10	8 30	15 40	20 50	24 60
9 Hardwood litter	Conifers Hardwoods	3 8	7 25	12 40	18 50	22 60
10 Timber (litter & understory)	All	3	8	12	16	20
11 Logging slash, light	All	3	8	12	16	20
12 Logging slash, medium	All	3	5	10	16	20
13 Logging slash, heavy	All	2	4	8	15	20

## Dozer Fireline Construction Rates (single pass) in Chains/Hour

NOTE: Prediction rates vary with conditions. The higher rate can be used for newer dozers (1975 and later).

Fire Behavior Fuel Model	Up or Down Slope	Slope Class			
		1 0-25%	2 26-40%	3 41-55%	4 56-74%
Type III Dozer 1,2	Up Down	55-90 90-110	30-55 90-110	8-30 20-90	0-8 0-20
3,5,8	Up Down	45-70 70-80	25-45 65-80	2-25 0-65	0-2 0
4.00	Up Down	20-35 35-40	10-20 25-40	0-10 0-25	0 0
6,7,9	Up Down	35-55 55-60	15-35 40-60	0-15 0-40	0 0
11,12	Up Down	15-25 25-30	7-15 10-30	0-7 0-10	0 0
10,13	Up Down	8-15 10-15	3-8 5-10	0-3 0-5	0 0
Type II Dozer 1,2	Up Down	85-125 125-145	60-85 130-145	30-60 75-130	0-30 0-75
3,5,8	Up Down	70-105 105-120	45-70 105-120	15-45 55-105	0-15 0-55
4.00	Up Down	35-60 60-75	20-35 65-76	2-20 20-65	0-2 0-20
6,7,9	Up Down	50-85 85-100	30-50 85-100	7-30 40-85	0-7 0-40
11,12	Up Down	25-40 40-55	15-25 45-55	1-15 0-45	0-1 0
10,13	Up Down	10-20 20-25	7-10 20-25	0-7 0-20	0 0
Type I Dozer 1,2	Up Down	100-140 140-155	70-100 140-155	35-70 85-140	0-35 0-85
3,5,8	Up Down	75-110 110-130	50-75 110-130	20-50 55-110	0-20 0-55
4.00	Up Down	45-70 70-80	30-45 75-85	8-30 25-75	0-8 0-25
6,7,9	Up Down	65-95 95-110	40-65 90-110	15-40 50-90	0-15 0-50
11,12	Up Down	35-55 55-65	20-35 55-65	3-20 6-55	0-3 0-6
10,13	Up Down	20-35 35-40	9-20 30-40	0-9 0-30	0 0

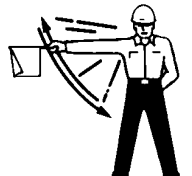
## Dozer Use Hand Signals



**STOP** - Back and forth, waist high, swinging motion.



**COME AHEAD** - Up and down in front of spotter, from waist to arm's length above head.



**TURN** - Swing flag or light on side to which operator is to turn.



**REVERSE OR BACKUP** - Full circle in front of the spotter.



**CAUTION** - Wave flag or light in half circle at arm's length above head.



**ATTRACT OPERATOR'S ATTENTION** - May also use one blast on a whistle, horn, or other suitable device.

### SIGNALS GIVEN BY OPERATOR

- **CAN'T SEE SPOTTER** - Gun motor twice.
- **WANT DOZER HELPER TO COME TO DOZER** - Gun motor once.

## ICS Equipment Typing

### Engines

Components	Structure Engines		Wildland Engines				
	1	2	3	4	5	6	7
Pump Rating minimum flow (gpm) at rated pressure (psi)	1000+ 150	250+ 150	150 250	50 100	50 100	30 100	10 100
Tank Capacity Range (gal)	400+	400+	500+	750+	400- 750	150- 400	50- 200
Hose (feet) 2-1/2 inch 1-1/2 inch 1 inch	1200 400 ---	1000 500 ---	--- 500 500	--- 300 300	--- 300 300	--- 300 300	--- --- 200
Ladders (feet)	48	48	---	---	---	---	---
Master Stream (gpm)	500	---	---	---	---	---	---
Personnel (minimum)	4	3	2	2	2	2	2

Common Additional Needs:

- All-wheel drive
- Pump and roll
- High pressure pump (minimum 40 gpm @ 250psi)
- Class A Foam Proportioner
- Compressed air foam system (CAFS) with minimum 40 cfm compressor
- Additional personnel

## Water Delivery Information

### GPM for nozzles

Forester	3/16 tip: 10 gpm (50 psi nozzle pressure)
	3/8 tip: 30 gpm (50 psi nozzle pressure)
Variable Pattern	One inch: 20 gpm (100 psi nozzle pressure)
	1-1/2 inch: 60 gpm (100 psi nozzle pressure)

### Maximum efficient flow

One inch hose: 30 gpm
1-1/2 inch hose: 100 gpm

### Useful Information

- Test for flow (gpm) by time required to fill a fedco (5 gal. in 15 sec.=20 gpm)
- Maximum vertical height for drafting = 12 ft. (Mark 3)
- Loss of one foot draft per 1000 feet elevation
- Head pressure loss or gain : 5 psi per 10 feet elevation
- Friction loss for one inch hose:
  - 10 gpm = 4 psi per 100 ft.
  - 20 gpm = 12 psi per 100 ft.
  - 30 gpm = 26 psi per 100 ft.
- Friction loss for 1 1/2 " hose:
  - 10 gpm = 5 psi per 100 ft.
  - 20 gpm = 2 psi per 100 ft.
  - 30 gpm = 4 psi per 100 ft.
  - 60 gpm = 13 psi per 100 ft.
- Use check valve for pumping uphill to overcome back pressure at pump.
- Avoid use of hard suction for tandem pumping. Not designed to withstand positive pressures.
- Pump pressure = nozzle pressure + friction loss of hoselay ± head pressure + appliance friction loss.
- A double hose lay will reduce friction loss 1/4 of a single hoselay.
- Friction loss for gated wye: 5 psi
- Use of two suction hoses on intake will increase net pump pressure.

### Maximum horizontal distance-pumping

Single Mark 3 pump, 1 1/2 " hose, 50 psi nozzle pressure

10 gpm:	40,000 ft.
20 gpm:	10,000 ft.
30 gpm:	4,000 ft.
60 gpm:	800 ft.

### Maximum vertical distance-pumping

Single Mark 3 pump, 1 1/2 " hose, 50 psi nozzle pressure

10 gpm:	400 ft.	(Friction loss for hose not included)
20 gpm:	400 ft.	
30 gpm:	350 ft.	
60 gpm:	200 ft.	

# GALLONS OF WATER

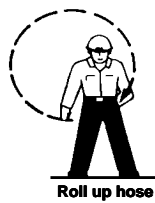
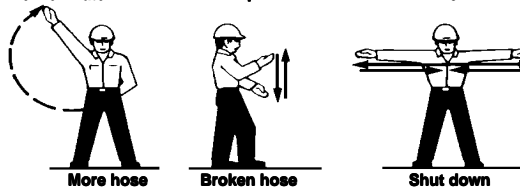
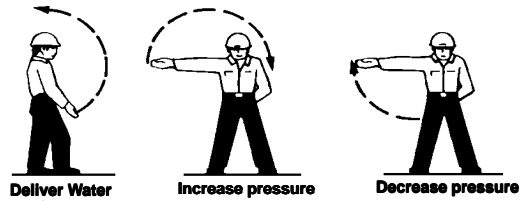
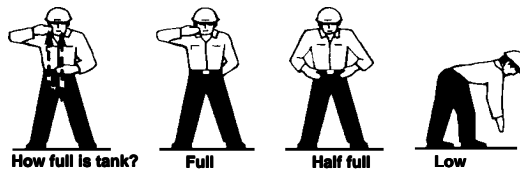
	5	10	50	100	150	200	250	300	350	400	450	500
1	0.5 OZ	1 OZ	6 OZ	13 OZ	19 OZ	25 OZ	32 OZ	38 Z	45 OZ	51 OZ	58 OZ	0.5 GAL
2	1 OZ	2.5 OZ	13 OZ	25 OZ	38 OZ	51 OZ	64 OZ	76 OZ	89 OZ	102 OZ	115 OZ	1 GAL
3	2 OZ	4 OZ	19 OZ	38 OZ	58 OZ	76 OZ	95 GAL	115 GAL	135 GAL	155 GAL	175 GAL	2 GAL
4	2.5 OZ	5 OZ	26 OZ	51 OZ	76 OZ	102 GAL	127 GAL	152 GAL	177 GAL	202 GAL	227 GAL	2.5 GAL
5	3 OZ	6 OZ	32 OZ	64 GAL	96 GAL	128 GAL	160 GAL	192 GAL	224 GAL	256 GAL	288 GAL	3 GAL
6	4 OZ	8 OZ	38 OZ	76 OZ	114 GAL	152 GAL	190 GAL	228 GAL	266 GAL	304 GAL	342 GAL	4 GAL
7	4.5 OZ	9 OZ	45 OZ	89 OZ	134 GAL	178 GAL	223 GAL	267 GAL	312 GAL	356 GAL	401 GAL	4.5 GAL
8	5 OZ	10 OZ	51 OZ	102 GAL	153 GAL	204 GAL	255 GAL	306 GAL	357 GAL	408 GAL	459 GAL	5 GAL
9	5.5 OZ	12 OZ	58 OZ	116 GAL	174 GAL	232 GAL	290 GAL	348 GAL	406 GAL	464 GAL	522 GAL	5.5 GAL
10	6 OZ	13 OZ	64 GAL	128 GAL	192 GAL	256 GAL	320 GAL	384 GAL	448 GAL	512 GAL	576 GAL	6 GAL

One gallon (GAL) is equal to 128 ounces (OZ) and one quart is equal to 32 ounces.

## F O A M M %

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## Wildland Water Use Hand Signals





### Average Perimeter in Chains

Acres	Perimeter	Acres	Perimeter
1	17	100	170
2	24	150	200
3	29	200	240
4	34	300	300
5	38	400	350
7	45	500	375
10	53	600	425
15	65	700	450
20	75	800	475
25	85	900	500
30	90	1,000	525
40	105		
50	120		
75	150		

One chain = 66 feet

**Fire Size Class**

<u>Class</u>	<u>Size</u>
A	0-1/4 acre
B	1/4 - 10 acres
C	10 - 99 acres
D	100 - 299 acres
E	300 - 999 acres
F	1000 - 4999 acres
G	5000+ acres

### **Fire Cause Determination Checklist**

- Take essential investigation materials to the incident.
- Make notes of all your actions and findings including:
  - Time fire was reported.
  - Name and identification of reporting party.
  - Enroute observations - people and vehicles.
  - Name and identification of persons or vehicles in vicinity of fire origin.
  - Record the weather.
- Locate and protect fire origin.
- Search fire origin area for physical evidence of fire cause.
- Protect evidence. **Do not remove** unless necessary to prevent destruction.
- Make sketches of origin area with measurements of relative locations of all evidence.
- Take photographs from all angles including long and medium distance, and close-up views of fire origin area and evidence.
- Turn over all notes, information, and physical evidence to the responsible law enforcement representative, or make your notes part of the official fire record.

## **Law Enforcement Field Safety**

- There is no such thing as a “routine contact.”
- Avoid confrontational situations.
- Be alert to potential problems. When making a contact, remain professional. Plan your approach. Recon the area and situation. The following indicators may alert you to a potentially dangerous situation:
  - Violator(s) is openly hostile.
  - Violator(s) is intoxicated.
  - Violator(s) is under the influence of drugs.
  - Violator(s) has weapons.
  - You are making contact alone.
  - Contact is made during night hours.
- The violator may have committed the offense unknowingly or accidentally, and should be treated with respect. If you believe this to be a potentially hostile contact:
  - Make every effort to have one or more additional officers with you.
  - Prior to leaving your vehicle, radio dispatch and report your location and nature of business. If possible, let violator see you use the radio.
  - Prior to leaving your vehicle, record vehicle license numbers, etc.
  - Obtain any information you can from adjacent users (complainants) before contacting violator.
- Be courteous, confident, firm, tactful. Let violator speak. Don’t show anger, threaten, talk down to them, use profanity, play down the offense, or try to be clever/witty.

## **Media Interviews**

- Prepare. Know the facts. Develop 2-3 key messages and deliver them. Prepare responses to potential tough questions. If possible, talk to reporter beforehand to get an idea of subjects, direction and slant of the interview.
- Be concise. Give 10-20 second, simple answers, and when you're done, be quiet. If you botch the answer, simply ask to start again.
- Be honest, personable, professional, presentable (remove sunglasses and hats).
- Look at the reporter, not the camera.
- Ensure media are escorted and wearing PPE when going to the fireline or hazardous sites.
- Ensure local Public Affairs office is aware of media visits.
- NEVER talk "off the record," exaggerate, or try to be cute or funny.
- DON'T guess or speculate or say "no comment." Either explain why you can't answer the question or offer to track down the answer.
- DON'T disagree with the reporter. Instead, tactfully and immediately clarify and correct the information.
- DON'T speak for other agencies or offices; or use jargon or acronyms.

## Phonetic Alphabet

	<b>Law Enforcement</b>	<b>International</b>
<b>A</b>	Adam	Alpha
<b>B</b>	Boy	Bravo
<b>C</b>	Charles	Charlie
<b>D</b>	David	Delta
<b>E</b>	Edward	Echo
<b>F</b>	Frank	Foxtrot
<b>G</b>	George	Golf
<b>H</b>	Henry	Hotel
<b>I</b>	Ida	India
<b>J</b>	John	Julliett
<b>K</b>	King	Kilo
<b>L</b>	Lincoln	Lima
<b>M</b>	Mary	Mike
<b>N</b>	Nora	November
<b>O</b>	Ocean	Oscar
<b>P</b>	Paul	Papa
<b>Q</b>	Queen	Quebec
<b>R</b>	Robert	Romeo
<b>S</b>	Sam	Sierra
<b>T</b>	Tom	Tango
<b>U</b>	Union	Uniform
<b>V</b>	Victor	Victor
<b>W</b>	William	Whiskey
<b>X</b>	X-Ray	X-Ray
<b>Y</b>	Young	Yankee
<b>Z</b>	Zebra	Zulu

### Standard Tones/Frequencies

TONES		TACTICALS	AIR/ GROUND
1	110.9		
2	123.0		
3	131.8		
4	136.5		
5	146.2		
6	156.7		
7	167.9		
8	103.5	COMMAND	
9	100.0		
10	107.2	FREQUENCY	SIMPLEX
11	114.8	REPEAT	
12	127.3		

**Local Frequencies**

SIMPLEX	REPEAT	TONE



### Contact List/Phone Numbers

Position/Name	Agency	Phone#/ Radio Freq.
<b>FIRE/CRASH RESCUE</b>		
Fire Rescue		
<b>MEDICAL</b>		
Ambulance Air Ambulance Hospital Hospital Burn Center Poison Center		
<b>LAW ENFORCEMENT</b>		
Police Police Site Security		
<b>ACCIDENT INVESTIGATION</b>		
24-hr. Reporting Safety Mgr.		



**NOTES**

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## Briefing Checklist

### Situation

- ☐ Fire name, location, map orientation, other incidents in area
- ☐ Terrain influences
- ☐ Fuel type and conditions
- ☐ Fire weather (previous, current, and expected)  
Winds, RH, Temperature, etc.
- ☐ Fire behavior (previous, current, and expected)  
Time of day, Alignment of slope and wind, etc.

### Mission/Execution

- ☐ Command  
Incident Commander / Immediate supervisor
- ☐ Commander's intent  
Overall Strategy / Objectives
- ☐ Specific tactical assignments
- ☐ Contingency plans

### Communications

- ☐ Communication plan  
Tactical, Command, Air-to-ground frequencies  
Cell phone numbers
- ☐ Medivac plan

### Service/Support

- ☐ Other resources  
Working adjacent and those available to order  
Aviation operations
- ☐ Logistics  
Transportation  
Supplies and equipment

### Risk Management

- ☐ Identify known hazards and risks
- ☐ Identify control measures to eliminate hazards / reduce risk  
Anchor point and LCES
- ☐ Identify trigger points for disengagement / re-evaluation of  
operational plan

### Questions or Concerns?

## FIRE ORDERS

**F**ight fire aggressively but provide for **safety first**.  
**I**nitiate all action based on current and expected **fire behavior**.  
**R**ecognize current **weather conditions** and obtain forecasts.  
**E**nsure **instructions** are given and understood.  
**O**btain current information on the **fire status**.  
**R**emain in **communication** with crew members, your supervisor, and adjoining forces.  
**D**etermine **safety zones** and **escape routes**.  
**E**stablish **lookouts** in potentially hazardous situations.  
**R**etain **control** at all times.  
**S**tay **alert**, keep **calm**, **think** clearly, **act** decisively.

## WATCH OUT SITUATIONS

1. Fire not scouted and sized up.
2. In country not seen in daylight.
3. Safety zones and escape routes not identified.
4. Unfamiliar with weather and local factors influencing fire behavior.
5. Uninformed on strategy, tactics, and hazards.
6. Instructions and assignments not clear.
7. No communication link with crew members or supervisor.
8. Constructing line without safe anchor point.
9. Building fireline downhill with fire below.
10. Attempting frontal assault on fire.
11. Unburned fuel between you and fire.
12. Cannot see main fire; not in contact with someone who can.
13. On a hillside where rolling material can ignite fuel below.
14. Weather becoming hotter and drier.
15. Wind increases and/or changes direction.
16. Getting frequent spot fires across line.
17. Terrain and fuels make escape to safety zones difficult.
18. Taking a nap near fireline.